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RESULTS OF INSPECTION OF EMERGENCY BUILDING PROJECTS FOR DECAY AND INSECT DAMAGE

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UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF PLANT INDUSTRY
Division of Forest Pathology
in cooperation with
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

RESULTS OF INSPECTION OF EMERGENCY BUILDING PROJECTS FOR DECAY AND INSECT DAMAGE

Surveys have been made by the Division of Forest Insects of the Bureau of Entomology and Plant Quarantine and the Division of Forest Pathology of the Bureau of Plant Industry, estending to the emergency building program the studies already under way in those Divisions on hazards to buildings and factors responsible for it. The survey has covered sample projects of the Federal agencies most concerned with defense housing and representing nearly all sections of the United States. On the basis of this survey it seems desirable to make a preliminary report on conditions found and safeguards needed, though further study may require modification of the conclusions thus far drawn.

In general, recent frame construction is definitely superior to that employed in the temporary buildings erected at the time of World War I. The error in many of those earlier buildings was in putting them on untreated wooden piers resting directly on the soil, and much trouble promptly resulted. This error has been observed in only a few projects of the present construction program. However, numerous incidental wood-soil contacts occur in the buildings put up by some of the agencies.

In the majority of the buildings there is little reason to fear early damage, but the larger proportion of sapwood in the lumber now being used and the moist character of some of the sites combine with certain of the present construction features to create a definite hazard from both decay and termites in a considerable number of places. Fortunately most of the faults in location or construction can be avoided easily in further building, and there should be no great damage to existing structures if systematic attention is given to maintenance.

Wood in Contact with Soil

Where masonry or concrete pillars were used for foundations, and mineral board for skirting between the piers, this skirting was often anchored to wooden stakes or brackets that extend from the soil to the sills or joists. Decay or termites have already attacked these supports in several of the places inspected. Some of the agencies have anchored the skirting to the sills, joists, or piers, thus providing no such bridges for the entrance of enemies into the building and this method is strongly advised for future construction. Where these wood connections are now present, they can be left in place with safety only as long as each is found sound by systematic examination at least once each year.

Attention of:
Evenden
Nagel
Gibson
Rust
Terrell
English

In many places where the construction was safe at the time it was completed by the contractors, a hazard has been created, particularly in the North, by subsequent grading of soil against the wall to a height sufficient to bring the soil into contact with the wood. The soil level should be lowered enough to break the contact with the wood, at least during the warmer months.

Most dirt-filled porches have been constructed without installing metal aprons to separate the dirt and the porch slabs from the subfloor timbers back of the porch. The porch slab usually abuts the building at a point above the top of the foundation and thus creates a hazard from both termites and fungi. The sills and other wooden members back of such porches therefore need especially frequent and thorough inspection. At best, considerable damage may occur at such places before there is visible evidence of it.

Wooden porches or steps with the supporting members resting directly on the ground or on untreated wood blocks were found at several projects. In other places the supports were resting on concrete but the soil had been graded up against the wood. All steps or porches having such contacts with soil should be separated from the main building by a space of at least 1-1/2 inches, a practice that was observed at only a few places.

Wooden basement window frames or frames of access doors were frequently found in contact with the soil and may easily serve as bridges between the soil and the structure above.

One of the most difficult problems has been that of getting contractors to avoid burial of form boards and scraps of lumber in the soil beneath buildings or adjacent to foundations. Burial of such wood debris offers opportunity for termites to build up large populations and may also provide a source for decay infection.

In colder areas where insulation of water pipes below the first floor is necessary, numerous instances were found where lumber and other insulating material used around vertical pipes formed a connection between the soil and the woodwork above.

Paper forms for concrete piers have commonly been left in place after the building has been completed. Where the soil is moist the paper-covered piers have acted as wicks, causing a dangerously high moisture content in the sills at the top of the pier. The paper may also favor the invasion of termites. The only safe procedure from the standpoint of both decay and termites is to remove all concrete forms, or at least the upper portion of them, after the pier has seasoned sufficiently. A moisture barrier on top of the pier, such as coal tar pitch, or, better, asphalt roofing mopped on with tar, would be desirable if paper must be left in place.

Foundations

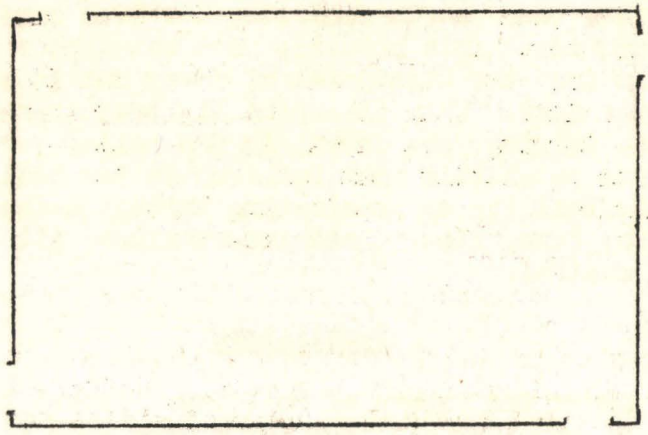
Masonry, rather than poured concrete, has been used for the foundations of most defense housing. This practice does not appear to present any particular problem from the standpoint of decay but it may result in future difficulty with termites. This is especially true where care has not been exercised to avoid burying wood debris in the soil adjacent to the foundation. If a termite population does build up in the soil, the termites may find access to the building by penetrating through defective mortar joints or voids within the foundation. Such infestations will be difficult to detect and expensive to control.

Ventilators

Ventilators under the floors of buildings without basements were in nearly all cases of considerably less total area than the 2 square feet per 25 linear feet of exterior wall that has been previously recommended. However, in the majority of instances they appeared to be adequate. Most of the moisture determinations made on joists and sills in the course of the survey showed less than 20 percent moisture, which provides a fairly safe margin since no important decay is known to take place under 25 percent. For ordinary situations a total ventilator area equal to 1/2 square foot for each 25 linear feet of outside wall plus 1/2 square foot for each 100 square feet of building area appears to give a reasonable safety factor for any shape or size of building. In dry situations even less is sufficient while in the wettest places or where proper cross ventilation can not be obtained it will probably be necessary to have more than this rule would call for. These figures are for ventilators screened with ordinary hardware cloth; if they are unscreened, about the same degree of safety can be had with ventilators only three-fourths as large.

Closure during the winter did not appear likely to cause serious trouble if the ventilators are opened promptly in the spring. In cold climates there was much condensation on sills in the houses in the wettest locations while the ventilators were closed, but decay fungi make little progress at low temperatures and if ventilators are properly placed sufficient drying is expected after they are opened. Further series of determinations will be made to check this. The principal ventilation deficiencies observed were in the frequent cases in which ventilators closed for the winter have been left closed through May and June.

Previous recommendations for placing the ventilators to avoid dead air pockets appear from the moisture studies to have been amply justified. Where winter condensation has occurred on wooden members it has usually been at the corners. Therefore, the ideal position for ventilators is near the corners to insure the earliest possible drying of the timbers wet from this condensation. For small detached buildings in which there is to be a single ventilator in each wall, a pin-wheel placement of ventilators is proposed, as indicated in the accompanying sketch.



The most serious error observed in ventilator location was in placing them too high. In a number of cases they were found at the level of the joists, so that the joists prevented any true cross ventilation. The best height is probably just below the joists.

Soil Drainage

The one thing most evident from the survey is that differences in soil moisture under buildings are quite as important as differences in amount of ventilation. In a number of places buildings have been constructed on soil that was wet or even had standing water on it. The observed cases of condensation of moisture resulting from insufficient ventilator area or from winter closing of ventilators have been over wet soil. The fact that eaves are generally narrow or lacking and that gutters and downspouts are omitted on many of the projects has aggravated this soil moisture problem. Where the soil remains wet the obvious need is to provide drainage; if no practicable procedure results in dry soil, then adequate ventilation is the ordinary way out, always keeping ventilators open except when the weather is so cold that they have to be closed for fuel saving. No moist-situation cases have been found which could not be rather easily handled by drainage, increased ventilation, or a combination of the two.

Effect of Heating Plants or Pipes Below Floor

Heating plants or hot air pipes under the floor generally decrease the danger of excessive moisture, at least in the part of the building near the source of heat. However, in two kinds of situations subfloor heaters have been reported to favor moisture accumulation or decay. In the first type of case, one-story houses with heaters below the floor had been built without stops in the walls. It appeared that relatively warm and damp air from below the floor went up in the wall into the cold space under the roof, where part of its moisture condensed and caused extensive decay. Stops to prevent such air movement were put in the walls by the agency managing the project and no further evidence of decay development has been reported. In the other type of case the amount of heat given off was sufficient to increase

evaporation under the center of the house but not enough to warm the whole substructure space. The vaporized water condensed on the cold sills. Where such condensation is continuous during the winter and cannot be stopped by soil drainage, it may be necessary to leave part of the ventilators open during the winter.

Decay of Siding

Siding decay rarely occurs in the North, or anywhere in heartwood siding. However, where siding containing much sapwood and backed by a vaporproof building paper such as asphalt felt has been used in the Coastal Plain area, without protection by eaves or gutters, there have been troublesome cases of decay or of paint failure due to stain fungi developing within the first year or two of occupancy. Sapwood, whether of cypress or any other species, is not resistant to fungi. Decay of siding can ordinarily be avoided in new construction in the warmer and moister climates by omitting all building paper except around doors and windows andtthere using only a tarred felt. Green material and mitre joints at the corners, resulting in development of open cracks through which water can enter, have aggravated the trouble in some cases. Where green material is used it is best not to paint it until the wood has had time to dry; though after the siding is dry, paint maintenance can help by keeping cracks sealed.

Maintenance

Against insects and decay as against fire, it is impracticable to construct low-cost buildings in such a way as to make them absolutely safe. Good construction reduces the danger of deterioration to a reasonable minimum but does not prevent all possibility of damage. However, reasonable care in construction plus a small but systematic amount of attention in subsequent maintenance should make wood sufficiently safe against fungi and termites, not only for the length of life expected in most defense housing projects but also for an indefinite future. The responsibility of occupants or maintenance agencies for safeguarding the continued usefulness of the buildings should be clearly understood and definitely allocated. If this is done, maintenance expense will ordinarily be negligible.